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ILLINOIS COMMERCE COMMISSION

STAFF REPORT TO THE COMMISSION  
April 7, 2000

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ILLINOIS  
COMMERCE COMMISSION  
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CHIEF CLERK'S OFFICE

**SUBJECT:** Electric Service Reliability Standards

**CAPSULE SUMMARY:**

Before 1997, Illinois electric utilities had the right to request increases in rates for bundled electric service that would allow full recovery of all reasonable utility expenses, including those resulting from the operation and maintenance of the transmission and distribution systems. In addition, electric utilities were allowed to recover from ratepayers a reasonable return of and on all prudent investments dedicated to public service, including all prudent investments in the transmission and distribution systems.

As a result of the enactment of Section 16-111(a) of the Public Utilities Act, rates for bundled services are capped during the mandatory transition period. Even though a utility may recover some of its costs and investment in the transmission and distribution systems under delivery services rates and FERC-set transmission tariffs, the traditional ratemaking incentives for investment in transmission and distribution facilities and the automatic recovery of all reasonable expenses no longer exist. This fact, coupled with the well-publicized service reliability problems in Northeastern Illinois in recent years, warrants Commission consideration of new incentives for electric utilities to maintain the reliability of the transmission and distribution systems in Illinois.

83 Ill. Adm. Code 411, "Electric Reliability", ("Part 411") requires that utilities begin collecting service interruption data on each customer beginning in 1999, and utilities have the necessary information and resources to calculate the cost of complying with various reliability standards. With the apparent need to consider new mechanisms to avoid reliability problems in Illinois, electric service reliability standards may be attractive, but the Commission does not have the information to make informed decisions about reliability standards.

Staff recommends that the Commission issue an order citing Central Illinois Light Company ("CILCO"), Central Illinois Public Service Company ("AmerenCIPS"), Commonwealth Edison Company ("ComEd"), Illinois Power Company ("Illinois Power"), MidAmerican Energy Company ("MidAmerican"), and Union Electric Company ("AmerenUE") to provide service reliability information and cost estimates for compliance with electric service reliability standards selected by the Commission. The purpose of the citation proceeding would be to provide to the Commission the information it needs to select appropriate electric service reliability standards for inclusion in Part 411.

**BACKGROUND:**

P.A. 90-561 added Section 16-125 to the Public Utilities Act in December 1997. Section 16-125 required the Commission to adopt new electric reliability rules by mid-1998, and

the Commission met that deadline. While there was some advocacy of electric reliability standards as a part of that expedited rulemaking process, the Commission did not find support for immediate adoption of standards in the record ultimately compiled in that proceeding.

In 1998, unusually severe weather caused frequent high winds and lightning over Illinois and one major ice storm in Northern Illinois. This weather, in combination with possible utility failures in tree trimming and distribution equipment maintenance, caused an increase in both the frequency and duration of electric service interruptions. In the summer of 1999, ComEd's equipment in Chicago and other communities began to fail with alarming frequency, causing long duration electric service interruptions to large numbers of customers. At the time of these outages, it was noted that ComEd's poor reliability did not appear to violate any provisions of the Commission's electric reliability rule.

A look at 1998 system-wide indices in Table 1 shows that ComEd is not the least reliable electric utility in Illinois in terms of the reporting requirements of Part 411. Three Illinois utilities had System Average Interruption Frequency Index ("SAIFI") numbers worse than ComEd, and MidAmerican bested ComEd by only 0.04, while AmerenCIPS set itself apart with a very low number. AmerenUE reported a Customer Average Interruption Duration Index ("CAIDI") number nearly twice the next highest number, but ComEd tops the interruption duration numbers of the other five utilities, with Illinois Power running a close third.<sup>1</sup>

Table 1

<b>SAIFI Utility</b>	<b>1998 SAIFI</b>		<b>CAIDI Utility</b>	<b>1998 CAIDI</b>
CILCO	2.84		AmerenUE	519
Illinois Power	2.44		ComEd	274
AmerenUE	2.23		Illinois Power	267
ComEd	2.20		CILCO	162
MidAmerican	2.16		MidAmerican	146
AmerenCIPS	0.66		AmerenCIPS	122

Since the adoption of Part 411, the Commission Staff has maintained an ongoing dialogue with persons involved in that proceeding, who have expressed a continuing desire for performance standards in the electric reliability rule. These discussions have touched upon the base line upon which performance standards should be based and the degree to which utility service territories should be subdivided for reliability reporting purposes. Discussions have also touched upon the appropriate level of the individual customer reliability targets in Section 411.140(b)(4).

<sup>1</sup> SAIFI represents the average number of times an electric utility customer experienced a service interruption longer than one minute during a specific statistical period. CAIDI represents the average interruption duration experienced by customers whose service was interrupted for longer than one minute during a specific statistical period.

Staff agrees that electric service reliability performance standards are desirable but believes that, without further information, the Commission would find the creation of appropriate performance standards nearly impossible. Staff recognizes that lowering the targets for individual customer interruptions is attractive but also recognizes the challenge of supporting a particular target level in the face of differing opinions and limited data on electric service interruptions and the cost of meeting a given standard level of reliability.

### **SETTING STANDARDS:**

Utilities argued successfully against setting standards in the Commission's two most recent electric reliability rulemaking proceedings.<sup>2</sup> Utilities also favored using system-wide and circuit specific reliability indices, SAIFI and CAIDI, and monitoring "Worst Performing Circuits".<sup>3</sup> Staff began the last two rulemakings by arguing for reliability standards based on individual customer-based standards and against standards based on system-wide indices. Staff then dropped the standards issue, but gained consensus on reliability targets for individual customers. Staff's position evolved for four reasons: the very strong utility opposition to the customer-based standards, the lack of support from other parties for Staff's standards, the lack of available data on the number of interruptions experienced by individual electric customers in Illinois, and the lack of information on the expenses and capital investment the utilities might incur to meet any given set of standards. As explained later in this section, Staff still has no individual customer interruption data or compliance cost estimates from utilities.

It remains Staff's position that the interruption experience of the individual utility customer is the most important aspect of electric service reliability. Indeed, if every customer experienced reliable electric service with only an occasional interruption caused by forces outside a utility's control, then electric service reliability would not be an issue in Illinois. While there is nothing inherently wrong with the system-wide SAIFI and CAIDI indices, the problem is their historical application being limited to entire utility systems. Customer-based indices, which Staff favors and advocates, can measure the experience of individual utility customers: system-wide indices cannot. System-wide indices are not a good basis for reliability standards because they do not reveal the individual customer experience, the neighborhoods with frequent interruptions, the circuits with unusually poor performance, and differences in reliability between service areas, political boundaries, etc.

SAIFI and CAIDI concepts can, however, be applied to numbers of customers smaller than an entire utility system. The utility-supported idea of Worst Performing Circuits

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<sup>2</sup> In Docket No. 92-0186, the Commission added Subpart C to 83 Ill. Adm. Code 410 to expand its electric reliability rules. In consolidated Dockets No. 98-0005 and 98-0036, the Commission repealed Subpart C of Part 410 and replaced it with a new Part 411 (the current electric reliability rule).

<sup>3</sup> Section 411.20 defines "Worst Performing Circuits" as the one percent of circuits in each utility operating area with the worst reliability indices.

applies these indices to each distribution circuit. While far superior to system-wide application, circuit indices still ignore neighborhoods with special problems (like untrimmed trees) and individual customers with unique reliability problems. However, the data collection requirements of Section 411.110 now permit utilities to gather information on each individual customer's service interruptions. With that information in hand, utilities can calculate the values for indices based on small customer groups taking service on the load side (customer side) of specific distribution line protective devices, such as fuses, sectionalizers, and reclosers. As remotely read electronic meters, with their ability to automatically sense and report interruptions, replace electromechanical meters on customer services, utilities will find it even easier to keep track of individual customer service interruptions.

By applying SAIFI and CAIDI methodology to small groups of customers served by the same protection device on a distribution circuit and basing reliability standards on these indices, the Commission could achieve recognition of the reliability experiences of very small groups of customers while using the methodology inherent in the traditional indices. The Commission could even apply a multi-tiered set of standards to different groupings of customers. For example, standards could be developed for individual customers, small groups, whole circuits, service regions, and whole utility systems. However, the problem of how to select values for the standards will remain.

Utilities have been collecting data on individual customer interruptions since the beginning of 1999 and can begin immediately to provide this data to the Commission. Utilities can also study their distribution system designs, operation, and maintenance and provide the Commission with cost estimates of complying with whatever reliability standards the Commission might choose to investigate.

**PROPOSAL:**

Staff suggests that the Commission require utilities to provide information on the electric service interruption data they collected during 1999. Staff recommends that the Commission require the utilities to provide summary data for the following system levels: total system, operating regions, individual distribution circuits, last protection devices, and individual customers. Staff would prefer utilities to present the summary data in tables showing the number of circuits, protection devices, and customers that experienced a given level of reliability. Staff recommends tables like the tables that follow.

**SAIFI FOR CALENDAR YEAR 1999 ELECTRIC SERVICE**  
**The Number of Customers or Groups of Customers**  
**That Experienced a SAIFI Within A Specific Range**

SAIFI	Total System <sup>4</sup>	Operation Region <sup>5</sup>	Individual Distribution Circuit <sup>6</sup>	Last Protection Device <sup>7</sup>	Individual Customer <sup>8</sup>
0					
>0 up to 1					
>1 up to 2					
> 2 up to 3					
> 3 up to 4					
> 4 up to 5					
> 5 up to 6					
> 6 up to 7					
> 7 up to 8					
> 8 up to 9					
> 9 up to 10					
>10 up to 15					
>15 up to 20					
>20 up to 25					
>25 up to 30					
Over 30					
Column Total	XXXXXXXX				

<sup>4</sup> This column, titled "Total System" shall have only one entry. The entry shall represent the SAIFI for 1999 for the reporting utility's entire system and shall be placed in the row with the appropriate range.

<sup>5</sup> This column, titled "Operating Region" represents the operating regions of a utility's system. If a utility has not divided its system into operating regions, this column will be blank. In each cell will be an entry representing the number of operating regions with a SAIFI in the indicated range.

<sup>6</sup> This column, titled "Individual Distribution Circuit" represents each of the distribution circuits within the utility's system. In each cell will be an entry representing the number of circuits with a SAIFI in the indicated range.

<sup>7</sup> This column, titled "Last Protection Device" represents the last circuit breakers, reclosers, fuses, etc. that stand between the utility's system and the customers. Every protection device on a distribution circuit is the last protection device for some group of customers. In each cell will be an entry representing the number of protection devices with a SAIFI in the indicated range.

<sup>8</sup> This column, titled "Individual Customer" represents each customer served by a utility's system. In each cell will be an entry representing the number of customers with a SAIFI in the indicated range. In this case, SAIFI will equal the number of interruptions experienced by the individual customer, since the divisor in the SAIFI equation would be one.

**CAIFI FOR CALENDAR YEAR 1999 ELECTRIC SERVICE**  
**The Number of Customers or Groups of Customers**  
**That Experienced a CAIFI Within A Specific Range**

CAIFI <sup>9</sup>	Total System <sup>10</sup>	Operation Region <sup>11</sup>	Individual Distribution Circuit <sup>12</sup>	Last Protection Device <sup>13</sup>	Individual Customer <sup>14</sup>
0					
>0 up to 1					
>1 up to 2					
> 2 up to 3					
> 3 up to 4					
> 4 up to 5					
> 5 up to 6					
> 6 up to 7					
> 7 up to 8					
> 8 up to 9					
> 9 up to 10					
>10 up to 15					
>15 up to 20					
>20 up to 25					
>25 up to 30					
Over 30					
Column Total	XXXXXXXX				

<sup>9</sup> CAIFI is an acronym that stands for Customer Average Interruption Frequency Index. CAIFI is similar to SAIFI, but it is calculated a bit differently. Where the SAIFI equation uses a divisor that represents all customers served by a utility, CAIFI uses a divisor that represents only those customers that have experienced interruptions of service.

<sup>10</sup> This column, titled "Total System" shall have only one entry. The entry shall represent the CAIFI for 1999 for the reporting utility's entire system and shall be placed in the row with the appropriate range.

<sup>11</sup> This column, titled "Operating Region" represents the operating regions of a utility's system. If a utility has not divided its system into operating regions, this column will be blank. In each cell will be an entry representing the number of operating regions with a CAIFI in the indicated range.

<sup>12</sup> This column, titled "Individual Distribution Circuit" represents each of the distribution circuits within the utility's system. In each cell will be an entry representing the number of circuits with a CAIFI in the indicated range.

<sup>13</sup> This column, titled "Last Protection Device" represents the last circuit breakers, reclosers, fuses, etc. that stand between the utility's system and the customers. Every protection device on a distribution circuit is the last protection device for some group of customers. In each cell will be an entry representing the number of protection devices with a CAIFI in the indicated range.

<sup>14</sup> This column, titled "Individual Customer" represents each customer served by a utility's system. In each cell will be an entry representing the number of customers with a CAIFI in the indicated range. In this case, CAIFI will equal the number of interruptions experienced by the individual customer, since the divisor in the CAIFI equation would be one.

**CAIDI FOR CALENDAR YEAR 1999 ELECTRIC SERVICE**  
**The Number of Customers or Groups of Customers**  
**That Experienced a CAIDI Within A Specific Range**

CAIDI (Minutes)	Total System <sup>15</sup>	Operation Region <sup>16</sup>	Individual Distribution Circuit <sup>17</sup>	Last Protection Device <sup>18</sup>	Individual Customer <sup>19</sup>
0					
>0 up to 30					
>31 up to 60					
> 61 up to 90					
> 91 up to 120					
> 121 up to 150					
> 151 up to 180					
> 181 up to 210					
> 211 up to 240					
> 241 up to 270					
> 271 up to 300					
>301 up to 330					
>331 up to 360					
>361 up to 420					
>421 up to 480					
>481 up to 720					
>721 up to 1,440					
>1,441 up to 2,880					
>2,881 up to 4,320					
>4,321 up to 5,760					
>5,761 up to 7,200					
Over 7,200					

<sup>15</sup> This column, titled "Total System" shall have only one entry. The entry shall represent the CAIDI for 1999 for the reporting utility's entire system and shall be placed in the row with the appropriate range.

<sup>16</sup> This column, titled "Operating Region" represents the operating regions of a utility's system. If a utility has not divided its system into operating regions, this column will be blank. In each cell will be an entry representing the number of operating regions with a CAIDI in the indicated range.

<sup>17</sup> This column, titled "Individual Distribution Circuit" represents each of the distribution circuits within the utility's system. In each cell will be an entry representing the number of circuits with a CAIDI in the indicated range.

<sup>18</sup> This column, titled "Last Protection Device" represents the last circuit breakers, reclosers, fuses, etc. that stand between the utility's system and the customers. Every protection device on a distribution circuit is the last protection device for some group of customers. In each cell will be an entry representing the number of protection devices with a CAIDI in the indicated range.

<sup>19</sup> This column, titled "Individual Customer" represents each customer served by a utility's system. In each cell will be an entry representing the number of customers with a CAIDI in the indicated range.

Part of the process of establishing permanent reliability standards is a determination of the costs of compliance with the standards. Standards that exceed the current levels of electric service reliability will impose costs on utilities and, ultimately, on customers of those utilities. Just as there is no reliable data now available on what might be appropriate levels of system reliability, there is also no data available on the cost of establishing system reliability standards at certain levels. Costs could vary dramatically between levels of reliability and between different utility distribution systems. Only Illinois electric utilities are in a position to collect the necessary data and perform the initial studies of the cost of reliability standards.

Staff suggests that the Commission select sets of electric reliability standards within a range that it feels is reasonable for study purposes and require Illinois electric utilities to provide information on the cost they will likely incur to meet each set of standards. Sets of standards should include standards for interruption frequency and duration and should relate to five system levels: total system, operating region, individual distribution circuit, last protection device, and individual customer. Staff recommends five sets of standards with a range of reliability wide enough to cover a broad range of interruption frequencies and durations.

The following table contains standard values of SAIFI and CAIDI for five sets of reliability standards.<sup>20</sup> When examining the reliability of electric service, larger groups of customers allow utilities to average customers with excellent service reliability with customers whose service reliability has been poor. So, each of the five sets of standards below allows larger numbers of interruptions and longer interruption durations as customer groups grow smaller. In other words, the sets of standards allow more interruptions and longer durations for individual customers than for the average of all customers.

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<sup>20</sup> Staff has elected not to recommend standards for CAIFI because a SAIFI standard will cover interruption frequency, and a CAIFI standard might be redundant.



**PROPOSED SAIFI and CAIDI STANDARDS**  
**SAIFI is Shown in Numbers of Interruptions**  
**CAIDI is Shown in Average Minutes Per Interruption**

	System	Region	Circuit	Last Device	Customer
Reliability Standard Set #1	2.5 180	3.0 200	4.0 320	5.0 340	6.0 360
Reliability Standard Set #2	2.0 160	2.4 180	3.0 260	4.0 280	5.0 300
Reliability Standard Set #3	1.5 140	1.8 150	3.0 200	3.0 220	4.0 240
Reliability Standard Set #4	1.0 130	1.2 140	2.0 170	3.0 190	4.0 210
Reliability Standard Set #5	0.8 120	1.0 130	2.0 140	3.0 160	3.0 180

While the table above shows the SAIFI and CAIDI standard sets together for purposes of brevity, Staff does not believe there is necessarily a connection between the number of interruptions experienced by a customer and the duration of those interruptions. Interruption frequency is a function of the condition of the distribution system and related factors. Interruption duration is a function of the availability of repair crews, the distance from operations centers to customers, the design of system switching capability, and related factors. Staff recommends that the Commission treat the standard sets for interruption frequency and duration as separate standards and require utilities to provide separate cost estimates for meeting the two standards. To meet that requirement, utilities would need to fill in the following two tables and provide them to the Commission.

The first following table makes the assumption, for purposes of the cost estimates, that the Commission will adopt each of the performance standard sets on January 1, 2001, and asks the utilities to provide the Commission with 10 years of incremental costs of capital improvements and increases in operations and maintenance costs to comply with each standard set. These costs should include forecasted inflation.

The second following table makes the same assumptions and asks the utilities to provide the Commission with four incremental costs for each standard set. The four incremental costs represent the total January 1, 2001, present value cost of: (1) incremental capital improvements and operations and maintenance expenses necessary for the each utility to comply with the proposed standards, (2) the same cost per

typical residential customer, (3) the same cost per typical commercial customer, and (4) the same cost per typical industrial customer.

The cost estimates will be more valuable to the Commission if they are accompanied by explanations of exactly how the utility would spend the money and exactly what features of the utility's system, practices, and procedures require change to meet the standards. If a utility assumes a base cost other than that required to meet the reliability targets in Section 411.140(b)(4), the utility should explain its base cost assumption and support it.

Staff also recommends that the Commission allow and encourage the utilities to provide cost information on reliability standards that fall outside the bounds of the standards included in this report. It is possible that the utilities will learn something while performing their cost studies that would be useful to the Commission. Perhaps a set of standards with values higher or lower than those Staff has offered would provide interesting results. Perhaps a set of standards with a wider or more narrow range between the system-wide and individual customer values would provide useful information.

**YEARLY INCREMENTAL COST OF COMPLYING  
WITH PROPOSED RELIABILITY STANDARDS**  
Assuming Standards Are Adopted January 1, 2001

Proposed Set of Reliability Standards	Year 2001 Cost	Year 2002 Cost	Year 2003 Cost	Year 2004 Cost	Year 2005 Cost	Year 2006 Cost	Year 2007 Cost	Year 2008 Cost	Year 2009 Cost	Year 2010 Cost
SAIFI Set #1 Capital Cost										
SAIFI Set #1 O&M Cost										
SAIFI Set #2 Capital Cost										
SAIFI Set #2 O&M Cost										
SAIFI Set #3 Capital Cost										
SAIFI Set #3 O&M Cost										
SAIFI Set #4 Capital Cost										
SAIFI Set #4 O&M Cost										
SAIFI Set #5 Capital Cost										
SAIFI Set #5 O&M Cost										
CAIDI Set #1 Capital Cost										
CAIDI Set #1 O&M Cost										
CAIDI Set #2 Capital Cost										
CAIDI Set #2 O&M Cost										
CAIDI Set #3 Capital Cost										
CAIDI Set #3 O&M Cost										
CAIDI Set #4 Capital Cost										
CAIDI Set #4										

O&M Cost										
CAIDI Set #5 Capital Cost										
CAIDI Set #5 O&M Cost										

CUMULATIVE JANUARY 1, 2001, PRESENT VALUE INCREMENTAL COST  
OF COMPLYING WITH PROPOSED RELIABILITY STANDARDS  
for Ten Years, Assuming Standards Are Adopted January 1, 2001

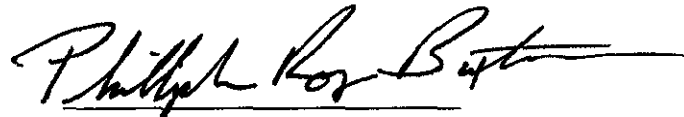
Proposed Set of Reliability Standards	Present Value Cost for Total Utility	Present Value Cost Per Residential Customer	Present Value Cost Per Commercial Customer	Present Value Cost Per Industrial Customer
SAIFI Set #1				
SAIFI Set #2				
SAIFI Set #3				
SAIFI Set #4				
SAIFI Set #5				
CAIDI Set #1				
CAIDI Set #2				
CAIDI Set #3				
CAIDI Set #4				
CAIDI Set #5				

Section 411.110(b) of the Commission's electric reliability rules delays record keeping requirements for small utilities that were exempted under the previous rule, 83 Ill. Adm. Code 410.430, in effect until November 7, 1998. Utilities in this group are Interstate Power Company, Mount Carmel Public Utility Company, and South Beloit Water, Gas and Electric Company. The rules do not require these small utilities to keep the records needed to respond to this staff report until January 1, 2002. The Commission will not benefit from adding these small utilities to its citation proceeding. Staff recommends that the Commission include the following electric utilities in its citation order:

- AmerenCIPS
- AmerenUE
- CILCO
- ComEd
- Illinois Power
- MidAmerican

**RECOMMENDATION:**

Staff recommends that the Commission open a docket and require Illinois electric utilities to provide the information explained in this report no later than ninety days after the entry of an order initiating a proceeding to order the production of the data referred to in this report, so that the Commission will have the information it needs to set electric service reliability standards.



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